

Remarks:

Claims 1-22 were pending in the present application. Claim 3 has been canceled herein, claims 1, 6-7, 13, 16 and 18 have been amended herein, and claim 23 has been added.

Applicant earnestly thanks Examiner for the thorough examination of the present invention. Applicant believes that all objections raised to the specification, drawings, and claims have been corrected by this amendment. Certain typographical errors that were identified during a review of the specification have also been corrected herein.

Substitute Specification

Examiner has requested that a substitute specification be provided because the specification filed on January 17, 2002 is missing pages 3, 7, 9, and 12. A substitute specification is being submitted herewith under 37 CFR 1.125(a). Applicant submits that no new subject matter is being added because (1) claims 3, 7, 9, and 12 were originally submitted to the patent office in the original filing dated September 28, 2001, and (2) the Patent Office acknowledged receipt of the full 23 pages of the Substitute Specification submitted on January 17, 2002 in the form of the Return Receipt Postcard; a copy of the Return Receipt Postcard is provided herewith.

Specification

The specification was objected to for failing to provide proper antecedent basis for the claimed subject matter. A response to each of Examiner's objections is provided as follows:

With regard to claims 1 - 6, the following table lists Examiner's objections and Applicant's response:

Examiner's Objection	Response
a reference alignment mark	The specification has been amended to clarify

	<p>that the alignment feature 14 can be a reference alignment mark at page 15, the paragraph beginning at line 1. Support for this amendment is provided for in originally filed claim 5 wherein it was disclosed that “the reference mark comprises the first alignment mark.” Applicant notes that the claim is not limited to the above described embodiment, and in fact page 15, lines 5 – 6 disclose that the reference mark could be “some other feature located on wafer 13” without limiting this feature to the first alignment mark.</p>
the reference mark being detected with a first alignment mark	<p>The claims do not require that the reference mark be detected “with” a first alignment mark, but rather merely require detecting a first alignment mark “and” a reference alignment mark. One example is disclosed at page 15, lines 10 – 13, which states that the reference mark can be detected by the wavefront sensing tool, which is also used to detect the first alignment mark (see page 13, lines 6 – 15). This example is by way of illustration only and should not be construed as limiting the scope of the claims.</p>
the reference mark being detected with a second alignment mark	<p>The claims do not require that the reference mark be detected “with” a second alignment mark, but rather merely require detecting a second alignment mark “and” a reference alignment mark. One example is disclosed at</p>

	page 15, lines 10 – 13, which states that the reference mark can be detected by an optical tool 50, which is also used to detect the second alignment mark (see page 13, lines 6 – 11). This example is by way of illustration only and should not be construed as limiting the scope of the claims.
forming a composite image from the first and second image by aligning the reference mark in the first and second image	A preferred embodiment composite image is disclosed in Figure 7. Support for Figure 7 and for the limitation that the images are aligned by a reference mark in the first and second image is provided for at page 14, line 14 through page 15, line 15. Note that the described embodiment is illustrative only and does not limit the scope of the claimed invention.
wherein the reference mark comprises the first alignment mark	One illustrative embodiment, wherein the reference mark comprises the first alignment mark is provided for at page 15, lines 9 – 13. As noted above, this limitation was in the claims as originally filed.

Regarding claim 11, Examiner objected to “a computer integrated within either the optical tool or the wavefront sensing tool.” The specification has been amended to clarify that the computer could be integrated into the wavefront sensing tool or the optical tool. Support for this amendment is found in originally filed claim 11.

Regarding claim 16, Examiner objected to “calculating a distance between the first and second alignment marks based upon the results of the step of determining the location of the first and second alignment marks.” Originally filed claim 16 provides

support for the amendment to the paragraph beginning on line 9 of page 14, wherein the specification now states that by overlaying the two images (one from the wavefront sensing tool and one from the optical tool), the “overlay alignment between the features, including the distance between the features, can be detected and measured.” Applicant respectfully submits that, given the teaching of Applicant’s disclosure, one of ordinary skill in the art could readily determine how to measure the distance between the alignment mark features without undue experimentation.

Regarding claims 18, 19, and 21 Examiner objected to subject matter regarding the third alignment mark. The paragraph beginning on line 1 of page 15 has been amended to disclose: “[A] third alignment mark, which third alignment mark could be detected with the optical tool and an image thereof formed. In one embodiment, the third alignment mark could be formed in a layer underlying the first and second layers in which the first and second alignment marks are formed, respectively, and a composite image of the first, second, and third alignment marks could be formed, as described above.” No new subject matter has been added, as the originally filed claims (particularly claims 18, 19, and 21) disclosed the above quoted subject matter.

Drawings

Various objections to the drawings have been corrected and three sheets of Substitute Formal Drawings are submitted herewith. Specifically, Figure 1A has been amended to include the designation “Prior Art” and to correct the caption to read “CROSS SECTION SHOWN BELOW.” Figure 1c has been amended to delete superfluous reference numeral 18 and to correct the location of reference numerals 13 and 14. The specification has been amended at page 11, line 23 to identify reference numeral 4 of Figure 5a. Figure 2 has been amended to show the connection between control logic 9 and stage 7. Figure 4a has been amended to delete the erroneous designation of the wafer surface by the reference numeral 28. Figure 5b has been amended to show reference numeral 8. Figure 6 has been amended to show reference numeral 4 associated with the light beam impinging upon instrument 1.

Claim Objections

Claims 16 was objected to because of the typographical error in which the word “by” was erroneously written as “be.” This has been corrected. Claim 18 has been amended by inserting the word “mark” after alignment. No new subject matter has been added by these amendments.

Claim Rejections

Claims 1, 2, and 4-5 were rejected under 35 U.S.C. 102(a) as being anticipated by U.S. Patent No. 6,269,322 to Templeton, et al. (“Templeton”). Claim 3, however, which depends from claim 1, was indicated as allowable subject matter by Examiner. Claim 1 has been amended to include the limitation of claim 3 that the first alignment mark is detected using a wavefront sensing tool (and claim 3 has now been canceled). As such, Applicant respectfully submits that claim 1, and claims 2 and 4- 6, which depend from claim 1, are in condition for allowance.

Claims 7-10 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,184,974 to Neal et al. (“Neal”) in view of U.S. Patent No. 6,356,345 to McArthur et al. (“McArthur”) further in view of U.S. Patent No. 5,369,488 to Morokuma (“Morokuma”) and U.S. Patent No. 5,843,831 to Chung et al. (“Chung”). Claim 7 has been amended to recite “an optical tool in the first light path, configured to detect an alignment mark in a layer on the semiconductor wafer.” Neal fails to teach or suggest this limitation. Applicant respectfully submits that the “position detector 33” of Figure 1d of Neal does not detect an alignment mark in a layer on the semiconductor wafer. Rather, the position detector merely “insure[s] that light is being properly directed to the sensor 26.” See Neal at column 5, lines 31 – 51. Applicant is unaware of any teaching or suggestion in McArthur, Morokuma, or Chung, either alone or in combination, of the recited claim elements, including an “optical tool in the first light path, configured to detect an alignment mark” and “a wavefront sensing tool in the second light path.” For


these reasons, Applicant submits that claim 7 as amended, and claims 8-15 which depend from claim 7, are allowable over the art of record.

Examiner has indicated that claims 16-22 would be allowable if the objections to claim 16 were overcome. Applicants believe that the objections have been overcome and that claims 16-22 are in condition for allowance. Newly added claim 23 is believed to also be in condition for allowance.

Applicant respectfully requests a prompt indication of the allowance of claims 1-2 and 4-23 and that the present application be passed to issuance.

Respectfully submitted,

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Date


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